

**What Is Claimed Is:**

1. A switching power supply apparatus for outputting a variable voltage comprising:

a pulse generating unit that sets a frequency of a pulse width modulation signal using capacitance applied to a capacitance input terminal;

a switching unit that intermittently connects an input voltage, applied from outside the switching power supply, in response to the pulse width modulation signal;

an output unit that smoothes the intermittent voltage from the switching unit, and outputs the same; and

a capacitance varying unit that varies the capacitance applied to the pulse generating unit in response to a controlling signal.

2. A switching power supply apparatus for outputting a variable voltage as recited in claim 1, wherein the controlling signal is generated outside of the switching power supply apparatus.

3. A switching power supply apparatus for outputting a variable voltage as recited in claim 1, wherein the capacitance varying unit comprises an NMOS transistor, a first capacitor, and a second capacitor.

4. A switching power supply apparatus for outputting a variable voltage as recited in claim 3, wherein, when no controlling signal is applied, the second capacitor

is not electrically connected to the pulse generating unit, and the capacitance is provided by the first capacitor.

5. A switching power supply apparatus for outputting a variable voltage as recited in claim 3, wherein, when the controlling signal is applied, the capacitance is set by the first and second capacitors.

6. A switching power supply apparatus for outputting a variable voltage as recited in claim 1, wherein the capacitance varying unit comprises an NMOS transistor array and a capacitor array.

7. A switching power supply apparatus for outputting a variable voltage as recited in claim 1, wherein:

the NMOS transistor array comprises: a first array NMOS transistor connected to receive a first signal; and a second array NMOS transistor connected to receive a second signal; and

the capacitor array comprises: a first array capacitor that is directly connected to the pulse generating unit; a second array capacitor that is connected to the pulse generating unit by the first array NMOS transistor; and a third array capacitor that is connected to the pulse generating unit by the second array NMOS transistor.

8. A switching power supply apparatus for outputting a variable voltage as recited in claim 7, wherein when the first signal is received by the first array NMOS transistor, the first array NMOS transistor connects the second array capacitor so that the first and second array capacitors are connected in parallel.

9. A switching power supply apparatus for outputting a variable voltage as recited in claim 7, wherein when the second signal is received by the second array NMOS transistor, the second array NMOS transistor connects the third array capacitor so that the first and third array capacitors are connected in parallel.

10. A switching power supply apparatus for outputting a variable voltage as recited in claim 1, wherein the switching unit comprises an N-channel Metal Oxide Semiconductor transistor comprising:

a drain terminal connected to the input voltage;

a source terminal connected to an input terminal of the output unit; and

a gate terminal controlled by the pulse width modulation signal output from the pulse generating unit.

11. A switching power supply apparatus for outputting a variable voltage as recited in claim 1, wherein the switching unit comprises a P-channel Metal Oxide Semiconductor transistor comprising:

a source terminal connected to the input voltage;

a drain terminal connected to an input terminal of the output unit; and

a gate terminal controlled by the pulse width modulation signal output from the pulse generating unit.

12. A switching power supply apparatus for outputting a variable voltage as recited in claim 1, wherein the output unit comprises:

an inductor connected between an output terminal of the switching unit and an output terminal of the output unit; and

a diode comprising a cathode terminal connected with a node to which the output terminal of the switching unit and an input terminal of the output unit are connected in common, and an anode terminal that is grounded;

wherein the first capacitor is connected between the output terminal of the output unit and a grounded terminal.

13. A switching power supply apparatus for outputting a variable voltage as recited in claim 1, wherein the capacitance varying unit comprises:

an NMOS transistor comprising a gate terminal electrically connected to a source of a controlling signal and a source terminal connected to a capacitance input terminal on the pulse generating unit;

a first capacitor connected between a drain terminal of the NMOS transistor and a grounded terminal; and

a second capacitor connected between the source terminal of the NMOS transistor and the grounded terminal.

14. A switching power supply apparatus for outputting a variable voltage as recited in claim 1, wherein the capacitance varying unit comprises:

an NMOS transistor array comprising gate terminals electrically arranged to receive a plurality of controlling signals from outside the switching power supply apparatus, wherein at least two of the NMOS transistors are series-connected between a capacitance input terminal on the pulse generating unit and a plurality of grounded terminals;

a plurality of capacitors connected between each source terminal of the NMOS transistors constituting the NMOS transistor array and each grounded terminal; and

a diode column oriented in a predetermined direction, connected between gate terminals of the NMOS transistor array.

15. A switching power supply apparatus for outputting a variable voltage as recited in claim 1, wherein the capacitance varying unit comprises:

a PMOS transistor array comprising gate terminals electrically arranged to receive a plurality of controlling signals from the switching power supply apparatus, wherein at least two of the PMOS transistors are series-connected between a capacitance input terminal terminal on the pulse generating unit and a plurality of grounded terminals;

a plurality of capacitors connected between each drain terminal of the PMOS constituting the PMOS transistor array and each grounded terminal; and

a diode array oriented in a predetermined direction, connected between gate terminals of the PMOS transistor array.

16. A switching power supply apparatus for outputting a variable voltage comprising:

a varactor diode;

a pulse generating unit, having a capacitance input terminal for receiving capacitance of the varactor diode and whose duty ratio is set by the capacitance of the varactor diode, that generates a pulse width modulation signal according to the set duty ratio;

a switching unit that intermittently connects an input voltage, applied from outside the switching power supply, in response to a pulse width modulation signal;

an output unit that smoothes the intermittent voltage from the switching unit, and outputs the same; and

a varactor diode controlling unit that varies the capacitance of the varactor diode using controlling voltages which respectively correspond to more than one controlling signal.

17. A switching power supply apparatus for outputting a variable voltage as recited in claim 16, wherein the controlling signal is generated outside of the switching power supply apparatus.

18. A switching power supply apparatus for outputting a variable voltage as recited in claim 16, wherein the varactor diode controlling unit comprises a microcomputer that receives the controlling signal and outputs the controlling voltages.

19. A switching power supply apparatus for outputting a variable voltage as recited in claim 18, wherein the output controlling voltage corresponds to a stored controlling signal value that is matched to the controlling signal.

20. A switching power supply apparatus for outputting a variable voltage as recited in claim 19, wherein the varactor diode controlling unit comprises a lookup table that stores the controlling signal values.

21. A switching power supply apparatus for outputting a variable voltage as recited in claim 16, wherein the switching unit comprises an N-channel Metal Oxide Semiconductor transistor comprising:

a drain terminal connected to the input voltage;

a source terminal connected to an input terminal of the output unit; and

a gate terminal controlled by the pulse width modulation signal output from the pulse generating unit.

22. A switching power supply apparatus for outputting a variable voltage as recited in claim 16, wherein the switching unit comprises a P-channel Metal Oxide Semiconductor transistor comprising:

a source terminal connected to the input voltage;

a drain terminal connected to an input terminal of the output unit; and

a gate terminal controlled by the pulse width modulation signal output from the pulse generating unit.

23. A switching power supply apparatus for outputting a variable voltage as recited in claim 16, wherein the output unit comprises:

an inductor connected between an output terminal of the switching unit and an output terminal of the output unit; and

a diode comprising a cathode terminal connected with a node to which the output terminal of the switching unit and an input terminal of the output unit are connected in common, and an anode terminal that is grounded;

wherein the first capacitor is connected between the output terminal of the output unit and a grounded terminal.



24. A switching power supply apparatus for outputting a variable voltage as recited in claim 16, wherein the varactor diode controlling unit comprises:

a lookup table that stores a plurality of controlling signal values and output voltage values corresponding thereto; and

a micro computer that receives a plurality of controlling signals, compares the controlling signals with the controlling signal values stored in the lookup table, and outputs the voltage value corresponding to the controlling signal value matching the received controlling signal to the varactor diode.

25. A switching power supply apparatus for outputting a variable voltage as recited in claim 20, wherein the lookup table may be one of a memory device, an Erasable Programmable Read Only Memory, an Electronically Erasable Programmable Read Only Memory, a mask ROM, or a flash ROM.

26. A switching power supply apparatus for outputting a variable voltage as recited in claim 24, wherein the lookup table may be one of a memory device, an Erasable Programmable Read Only Memory, an Electronically Erasable Programmable Read Only Memory, a mask ROM, or a flash ROM.

27. A switching power supply apparatus for outputting a variable voltage comprising:

pulse generating means for setting a frequency of a pulse width modulation signal using capacitance applied to a capacitance input terminal;

switching means for intermittently connecting an input voltage, applied from outside the switching power supply, in response to the pulse width modulation signal;

output means for smoothing the intermittent voltage from the switching means, and outputting the same; and

capacitance varying means for varying the capacitance applied to the pulse generating means in response to a controlling signal.

28. A switching power supply apparatus for outputting a variable voltage comprising:

a varactor diode;

pulse generating means for receiving a capacitance of the varactor diode and whose duty ratio is set by capacitance of the varactor diode, and generating a pulse width modulation signal according to the set duty ratio;

switching means for intermittently connecting an input voltage, applied from outside the switching power supply, in response to the pulse width modulation signal;

output means for smoothing the intermittent voltage from the switching means, and outputting the same; and

varactor diode controlling means for varying the capacitance of the varactor diode using controlling voltages which respectively correspond to more than one controlling signal.